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MANHATTAN DISTRICT HISTORY

BOOK IV - PILE PROJECT

X-10

VOLUME 6 - OPERATION

[redacted] SECRET" APPENDIX

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BY _____ DATE 8/21/72

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OFFICE OF CLASSIFICATION
JOHN R. BARTSOCK 9/6/79
REVIEWED BY DATE

Department of Energy Declassification Review

1st Review Date: 6/13/13	Determination: [Circle Number(s)]
Authority: ☐ DC ☐ DD	1. Classification Retained
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By Authority of the
U. S. Atomic Energy Commission

Per C Shugg Date 11-7-47
Carleton Shugg

Document No. [redacted] X-1583a

MANHATTAN DISTRICT HISTORY

BOOK IV - FILE PROJECT

X-10

VOLUME 6 - OPERATION

"TOP SECRET" APPENDIX

Group 1

[redacted]

Excluded from automatic downgrading and declassification

31 December 1946

[redacted] SECRET TRD 1325/17/5/1

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MANHATTAN DISTRICT HISTORY

BOOK IV - PILE PROJECT

VOLUME 6 - OPERATIONS

"TOP SECRET" APPENDIX

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6.	Plutonium Production
7.	Unit Costs for Processing Plutonium

SECTION 2 - PRODUCTION ESTIMATES, CODES, & MONTHLY OPERATIONS REPORTS

SECTION 3 - DOCUMENTS

[redacted] SECRET IRD

1. Total Uranium Received

Included in this graph are receipts of such items as billets, extruded rods, unbonded and bonded slugs and machined pieces. In computing the weight of uranium in rods in terms of equivalent metallic billets, a factor of 0.93 has been applied to the weight of rods. Similarly, a factor of 0.83 has been employed in converting from uranium slugs, bonded and unbonded, to rods, or an overall factor of 0.775 in deriving billets from slugs. In converting from machined pieces to billets, a factor of 0.78 has been used.

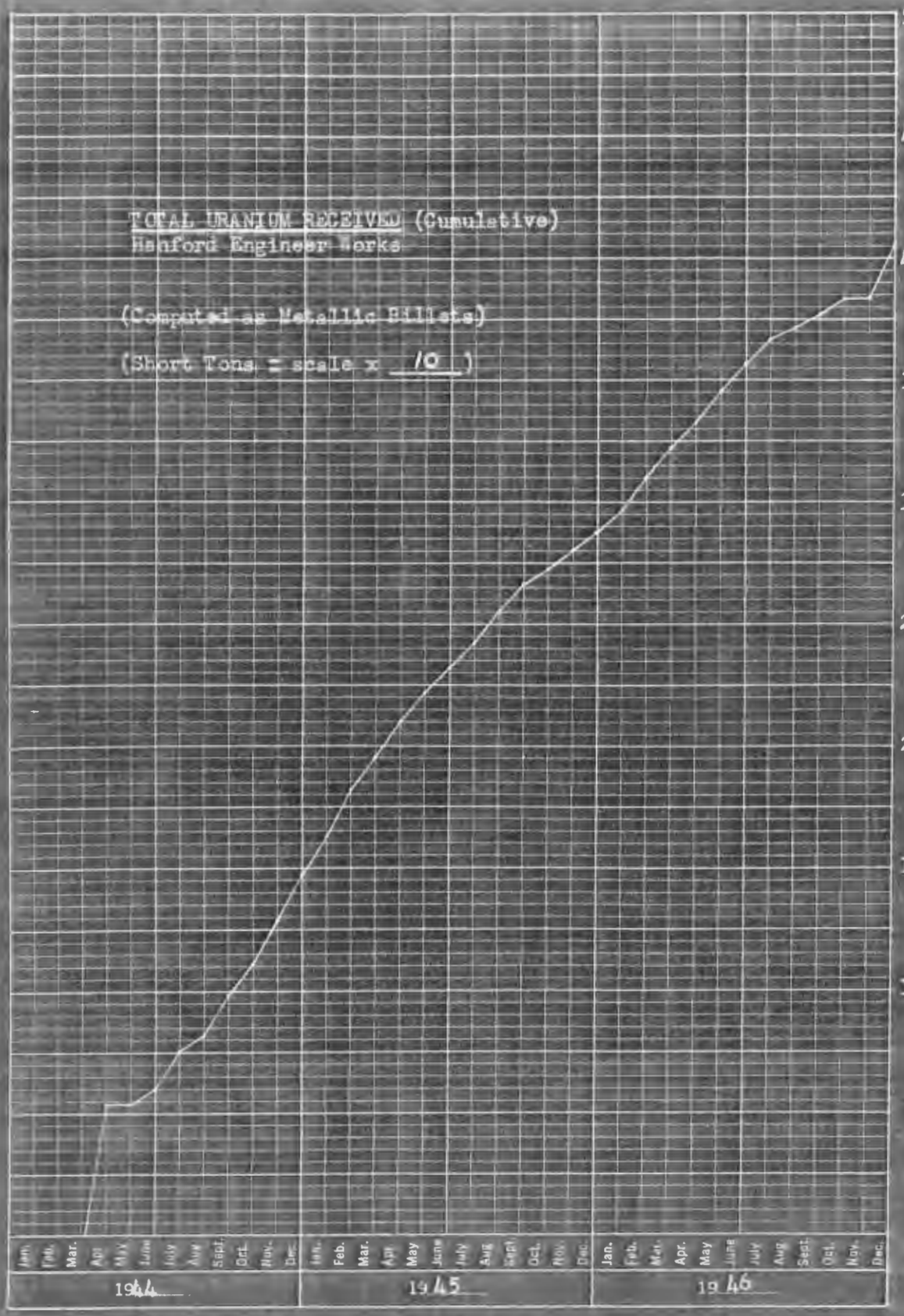

TOTAL URANIUM RECEIVED (Cumulative)
Hanford Engineer Works
(Computed as Metallic Billets)
(Short Tons = scale x 10)
500
450
400
350
300
250
200
150
100
50
0
Jan. Feb. Mar. Apl May June July Aug Sept. Oct. Nov. Dec.
1944
Jan. Feb. Mar. Apl May June July Aug Sept. Oct. Nov. Dec.
1945
Jan. Feb. Mar. Apr. May June July Aug Sept. Oct. Nov. Dec.
1946

Fig. 1

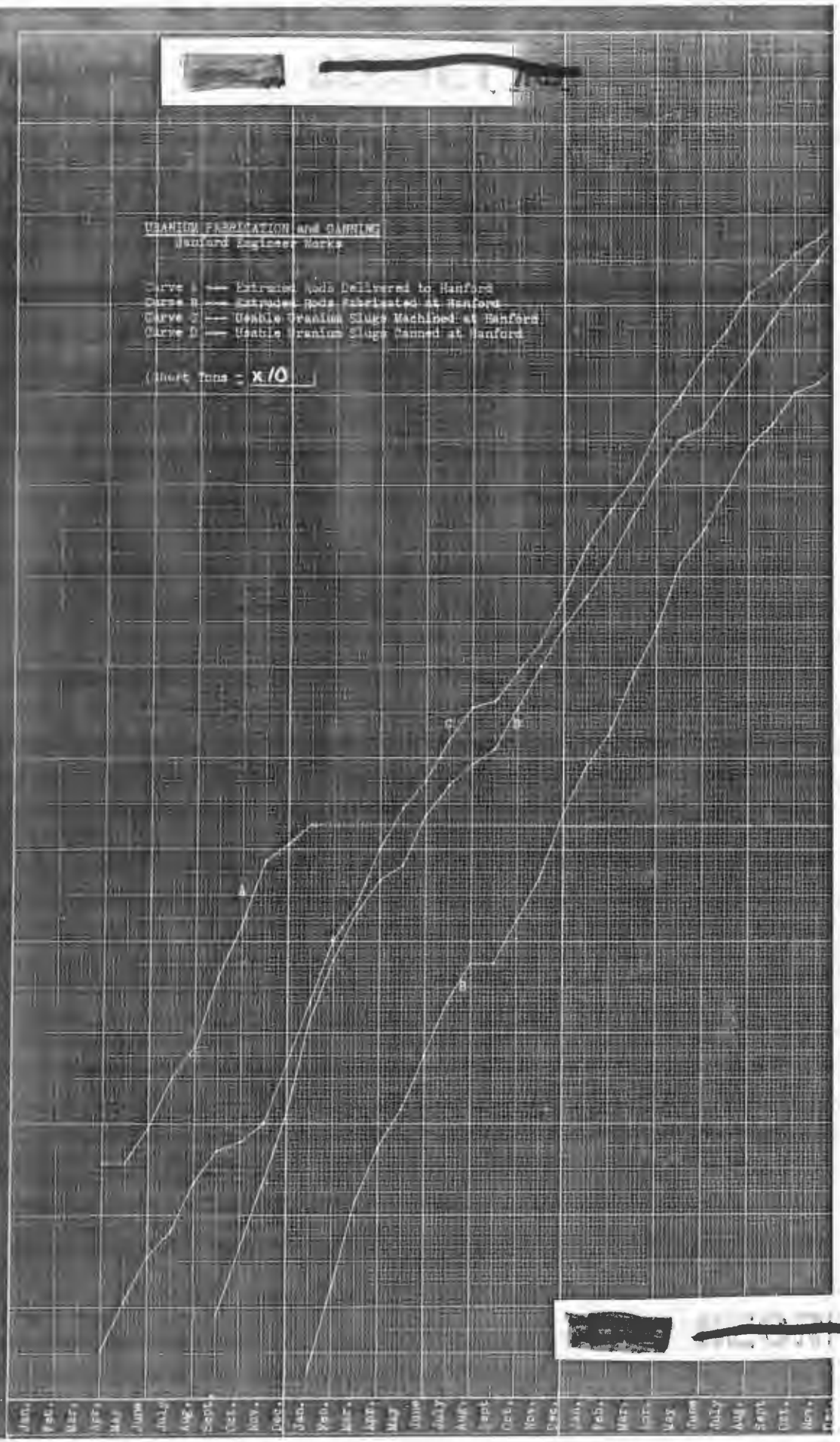
2. Uranium Fabrication and Canning

[redacted]

URANIUM FABRICATION and CANNING
Hanford Engineer Works

Curve A —— Extruded Rods Delivered to Hanford
Curve B —— Extruded Rods Fabricated at Hanford
Curve C —— Usable Uranium Slugs Machined at Hanford
Curve D —— Usable Uranium Slugs Canned at Hanford

(Short Tons - X10)



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3. Cumulative Production, Pile Areas

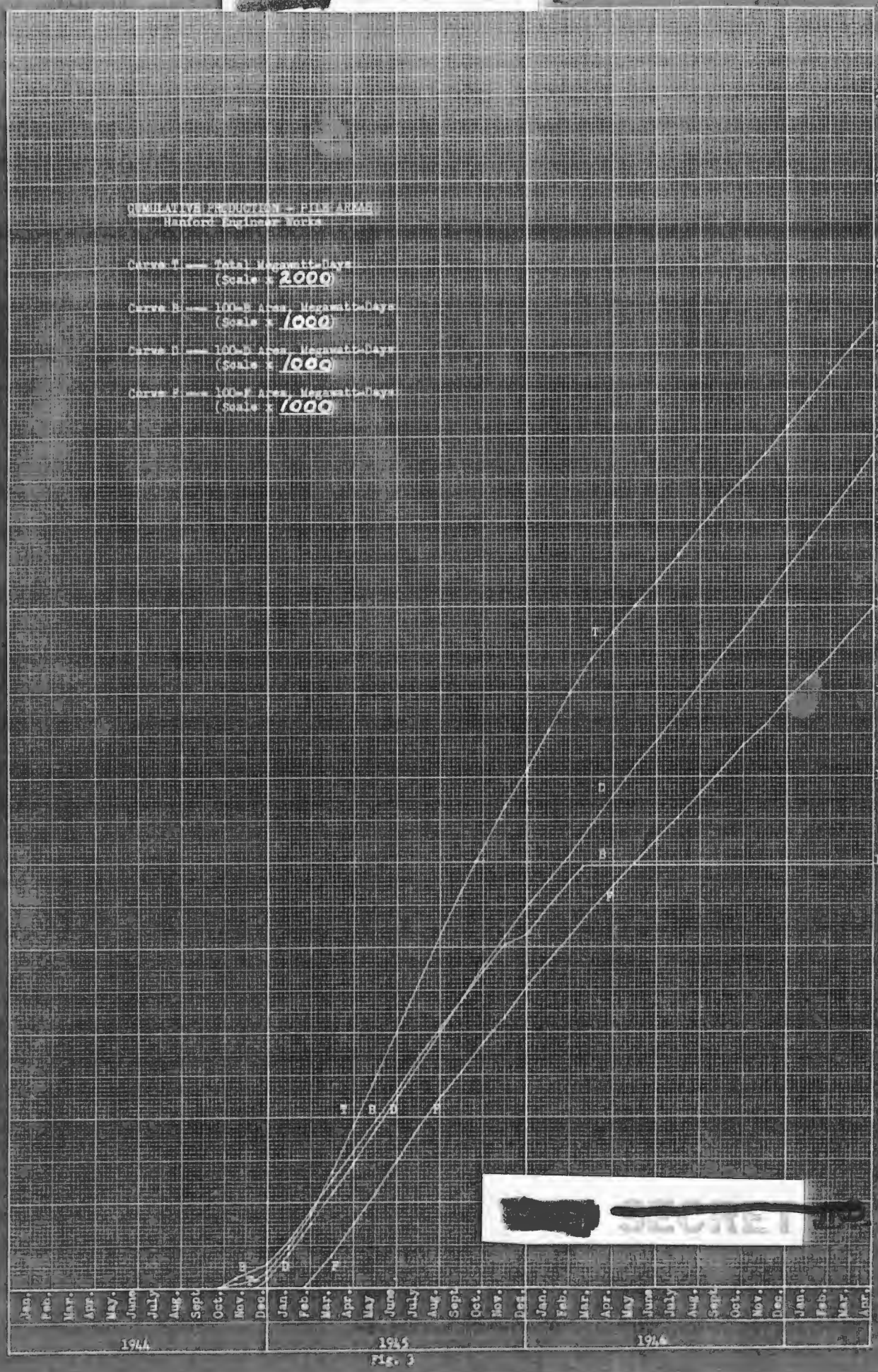
CUMULATIVE PRODUCTION - FUEL AREAS
Hanford Engineer Works
Curve T —— Total Megawatt-Days
(Scale x 2000)
Curve B —— 100-B Area, Megawatt-Days
(Scale x 1000)
Curve D —— 100-D Area, Megawatt-Days
(Scale x 1000)
Curve F —— 100-F Area, Megawatt-Days
(Scale x 1000)
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
T
D
B
F
Jan. Feb. Mar. Apr. May June July Aug. Sept Oct. Nov. Dec.
1944
1945
1946
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Fig. 3

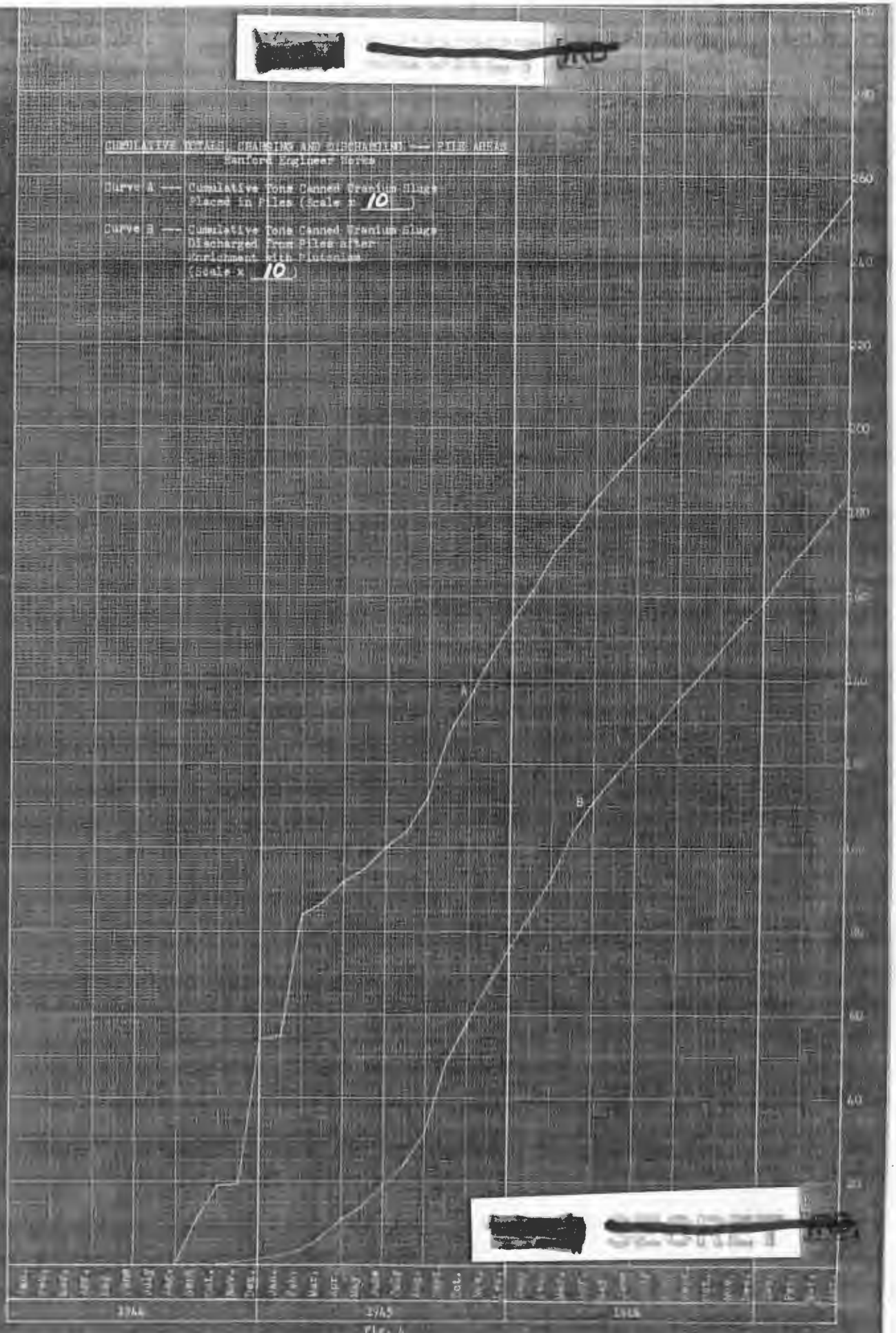
4. Cumulative Totals, Charging and Discharging - Pile Areas

[redacted]

CUMULATIVE TONS CHARGING AND DISCHARGING — PILE AREAS
Hanford Engineer Works

Curve A — Cumulative Tons Canned Uranium Slugs Placed in Piles (Scale x 10)

Curve B — Cumulative Tons Canned Uranium Slugs Discharged from Piles after Enrichment with Plutonium (Scale x 10)



[redacted]

Fig. 1

5. Uranium Dissolved and in Waste Storage

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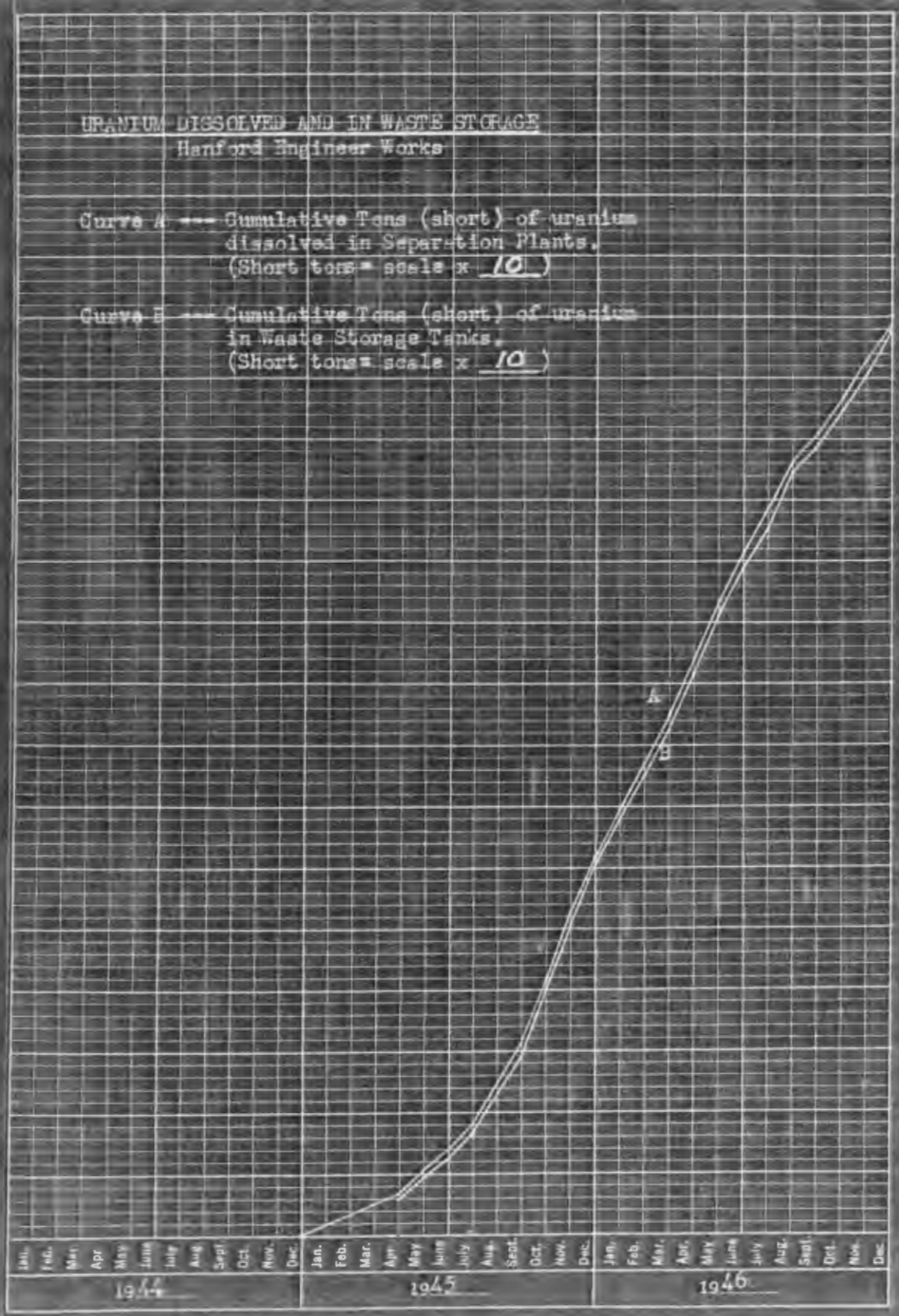

Fig. 5

[redacted]

6. Plutonium Production

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DELETED

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DELETED

DOE/K(S)

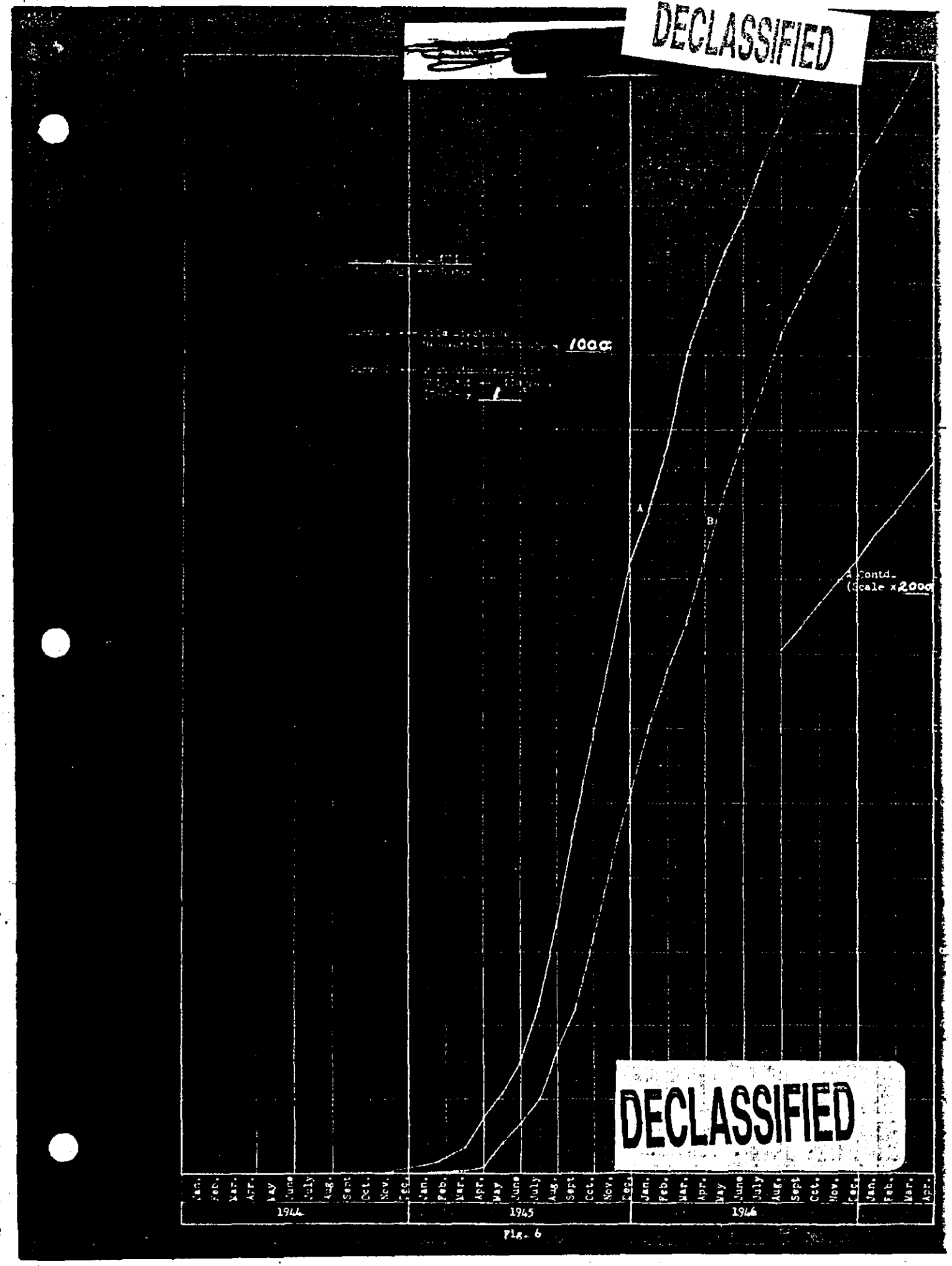
DECLASSIFIED
100α
A
B
Contd.
(Scale x 2000
DECLASSIFIED
Jan. Feb. Mar. Apr. May June July Aug. Sept Oct. Nov. Dec.
1944
Jan. Feb. Mar. Apr. May June July Aug. Sept Oct. Nov. Dec.
1945
Jan. Feb. Mar. Apr. May June July Aug. Sept Oct. Nov. Dec.
1946
Jan. Feb. Mar. Apr.

Fig. 6

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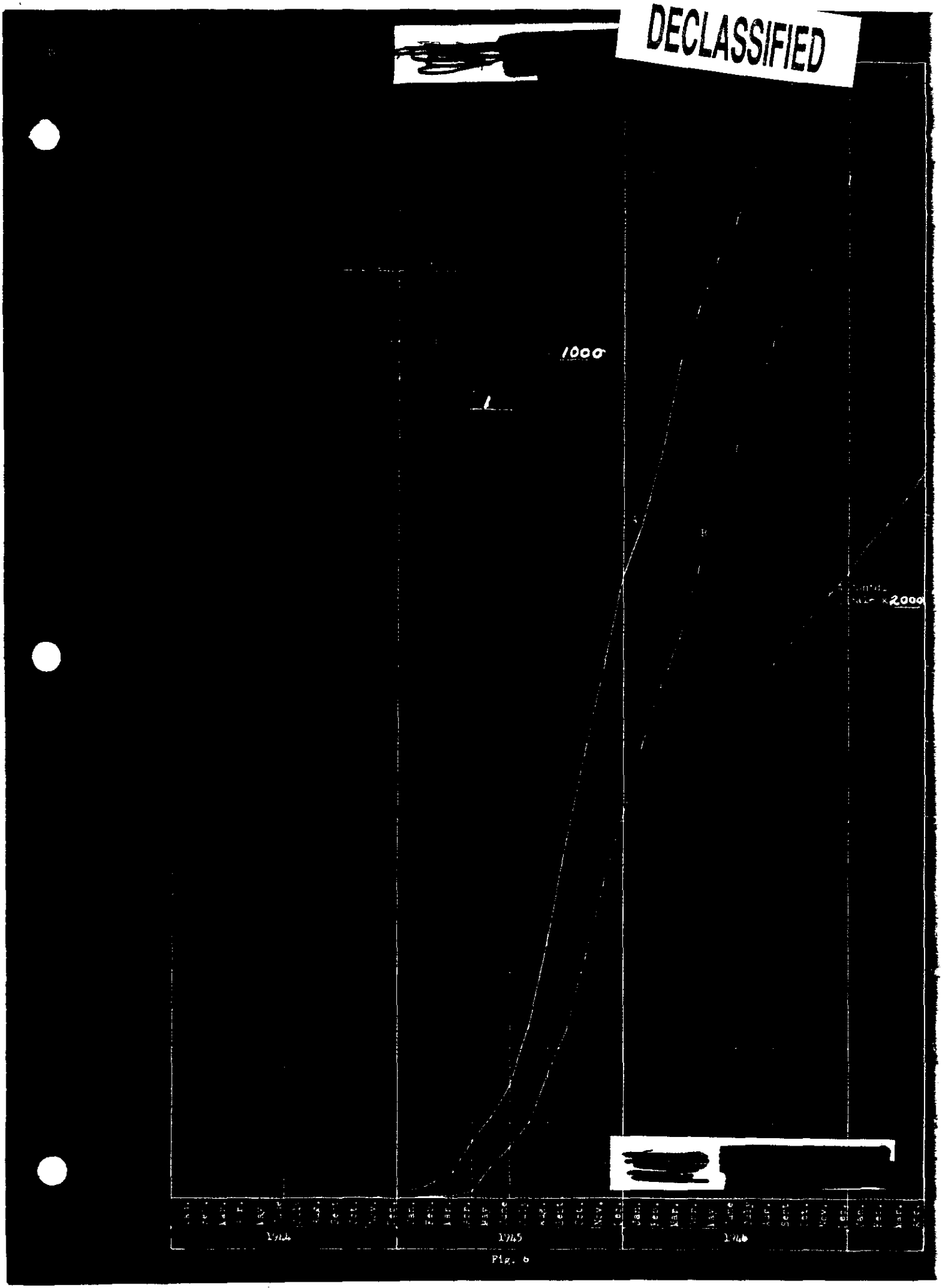

Fig. 6

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7. Unit Costs for Processing Plutonium

The unit cost of processing plutonium is based upon accumulated production and accrued operating expenditures including inventories. The costs of research, development, design, construction, amortization, offices of the District and Area Engineers, and metal are not included.

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SECTION 2 - PRODUCTION ESTIMATES, CODES AND MONTHLY OPERATIONS REPORTS

The following table constitutes a bibliography of the most important documents of "Secret" and "Top Secret" classification pertaining to production estimates, codes and monthly operations reports. Under "Document No." are listed present document numbers and in parentheses, file numbers used previous to 1 August 1945 when the new method was adopted. Attachments having a distribution similar to the main document are listed opposite the document in question; however, those attachments with different distributions are listed individually. In several cases documents have been destroyed and are indicated. The following abbreviations have been used:

Cy. - Copy

No. - Number

S. - Secret

Class. - Classification

A. E. - Area Engineer

A. E. C. - Atomic Energy Commission

TS. - Top Secret

Ltr - Letter

SECTION 2 - PRODUCTION ESTIMATES, GOALS, AND MONTHLY OPERATIONS REPORTS

Item No.	Document No.	Class.	Attachments	Title of Document	Distribution of Document	From/To	Date
1.	U-19-XX (TS-112)	TS	U-20-XX & U-21-XX	Study of Product Manufacture and Cost	Cy 1 - Groves Cy 2 - Nichols Cy 3 - A.E.C.File	Matthias/Groves	12/11/44
2.	U-16-XX (IT-500)	TS	U-17-XX	Production Estimate 12/1/44 to 1/1/46	Cy 1 - Tilley Cy 2 - Tilley Cy 3 - Groves Cy 4 - A.E.C.File Cy 5 - Du Pont	Otto/Tilley	11/21/44
3.	U-22-XX (IT-502)	TS	U-23-XX, U-24-XX & U-25-XX	Production Schedules 1/1/45 to 12/31/45	Cy 1, 2 & Cy 3 - Tilley * Cy 4 - A.E.C.File Cy 5 - Du Pont	Simon/Tilley	12/23/44
4.	U-30-XX (IT-508)	TS	None	Production Inventory and Schedule to 7/18/45	Cy 1, 2 & 3 - Tilley * Cy 4 - A.E.C.File Cy 5 - Du Pont	Simon/Tilley	3/19/45
5.	U-XXXV-3 (IT-510)	TS	None	Production Estimates(Ltr)	Cy 1 - Groves Cy 2 - Nichols Cy 3 - A.E.C.File	Williams/Groves	4/9/45

* Copies 1, 2, and 3 transmitted by Plant Manager to du Pont Office in Wilmington and on acceptance there copies 2 and 3 were transmitted to Groves and Nichols.

Item No.	Document No.	Class.	Attachments	Title of Document	Distribution of Documents	From/To	Date
6.	U-37-XX (IT-512)	TS	U-38-XX	Production Schedule to 9/30/45	Cy 1, 2 & 3 - Tilley * Cy 4 - A.E.C.File Cy 5 - Du Pont	Simon/Tilley	4/21/45
7.	U-47-XX	TS	U-48-XX U-49-XX U-50-XX U-51-XX	Product Production Forecast 8/1/45 to 2/1/46 and status as of 7/1/45	Cy 1 - Tilley Cy 2 - Destroyed Cy 3 - Destroyed Cy 4 - A.E.C.File Cy 5 - Du Pont	Simon/Tilley	7/5/45
8.	XX-5	TS	XX-25 XX-26 XX-27	Product Production Forecast 8/1/45 to 2/1/46 and status as of 8/1/45	Cy 1 - Tilley Cy 2 - Destroyed Cy 3 - Destroyed Cy 4 - A.E.C.File Cy 5 - Du Pont	Simon/Tilley	8/8/45
9.	XX-3	TS	XX-29 XX-30 XX-31	Product Production Forecast 10/1/45 to 1/1/46 and status as of 10/1/45	Cy 1 - Tilley Cy 2 - Tilley Cy 3 - Tilley Cy 4 - A.E.C.File Cy 5 - Du Pont	Simon/Tilley	9/27/45
10.	XX-10	TS	XX-35 XX-36 XX-37	Product Production Forecast 1/1/46 to 4/1/46 and status as of 1/1/46	Cy 1 - Tilley Cy 2 - Tilley Cy 3 - Tilley Cy 4 - A.E.C.File Cy 5 - Du Pont	Maskey/Tilley	12/28/45
11.	XX-13	TS	XX-41	Cost per gram of 49	Cy 1 - Brown Cy 2 - A.E.C.File	Skinner/Brown	2/20/46

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Item No.	Document No.	Class.	Attachments	Title of Document	Distribution of Documents	From/To	Date
12.	XX-18	TS	XX-45	Product Production Forecast and status as of 3/1/46	Cy 1 - Tilley Cy 2 - Tilley Cy 3 - Tilley Cy 4 - A.E.C.File Cy 5 - Du Pont	Miller/Tilley	3/12/46
13.	XX-63	TS	XX-65	Product Production Forecast and status as of 9/1/46	Cy 1 - A.E.C.File Cy 2 - Nichols Cy 3 - Groves	Lauder/Clarke	10/4/46

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Item No.	Document No.	Class.	Attachments	Title of Document	Distribution of Document	From/To	Date
1.	U-2-XX (IT-495)	TS		Security of Reports (Code)	Cy 1 - A.E.C.File Cy 2 - Destroyed Cy 3 - Destroyed Cy 4 - R. M. Evans Cy 5 - Du Pont	Simon/Matthias	7/21/44
			U-4-XX U-5-XX U-6-XX		Cy 1 - A.E.C.File Cy 2 - Groves Cy 3 - Nichols Cy 4 - R. M. Evans Cy 5 - Du Pont		
2.	U-9-XX (IT-496)	TS		Code Revisions	Cy 1 - A.E.C.File Cy 2 - Destroyed Cy 3 - Destroyed Cy 4 - R.M.Evans Cy 5 - Du Pont	Simon/Matthias	10/19/44
			U-10-XX U-11-XX U-12-XX		Cy 1 - A.E.C.File Cy 2 - Groves Cy 3 - Nichols Cy 4 - R.M. Evans Cy 5 - Du Pont		
3.	U-26-XX (IT-503)	TS		Code for Production Reports	Cy 1 - A.E.C.File Cy 2 - Destroyed Cy 3 - Destroyed Cy 4 - R. M. Evans Cy 5 - Du Pont	Simon/A.E.	1/16/45
			U-27-XX U-28-XX		Cy 1 - A.E.C.File Cy 2 - Groves Cy 3 - Nichols Cy 4 - R.M.Evans Cy 5 - Du Pont		

Item No.	Document No.	Class.	Attachments	Title	Distribution of Document	From/To	Date
4.	U-32-XX	TS	None	Code for Production Reports	Cy 1 - A.E.C.File Cy 2 - Nichols Cy 3 - Groves Cy 4 - R.M.Evans Cy 5 - Du Pont	Simon/A.E.	4/18/45
5.	XX-2	TS	XX-28	Code for Production Reports	Cy 1 - A.E.C.File Cy 2 - Nichols Cy 3 - Groves Cy 4 - R.M.Evans Cy 5 - Du Pont	Simon/A.E.	9/19/45
6.	XX-17	TS	XX-44	Code for Production Reports	Cy 1 - A.E.C.File Cy 2 - Nichols Cy 3 - Groves Cy 4 - R.M.Evans Cy 5 - Du Pont	Miller/Clarke	3/12/46
7.	XX-58	TS	XX-59	Code for Production Reports	Cy 1 - A.E.C.File Cy 2 - Nichols Cy 3 - Groves Cy 4 - Lauder Cy 5 - Lauder	Lauder/Clarke	9/11/46

Item No.	Document No.	Class.	Attachments	Title of Document	Distribution of Document	From/To	Date
1.	None	S	None	Monthly Operations Report, March 1944	Cy 1 & 2 - Nichols Cy 3 & 4 - A.E.C.Files	Matthias/Nichols	4/6/44
2.	None	S	None	Monthly Operations Report, April 1944	Cy 1 & 2 - Nichols Cy 3 & 4 - A.E.C.Files	Matthias/Nichols	4/28/44
3.	None	S	None	Monthly Operations Report, May 1944	Cy 1 & 2 - Nichols Cy 3 & 4 - A.E.C.Files	Matthias/Nichols	5/27/44
4.	U-1-XX (TS-90)	TS	None	Monthly Operations Report, June 1944	Cy 1 & 2 - Nichols Cy 3 - A.E.C.Files Cy 4 - Destroyed	Sally/Nichols	6/30/44
5.	U-8-XX (TS-93)	TS	None	Monthly Operations Report, July 1944	Cy 1 & 2 - Nichols Cy 3 - A.E.C. Files Cy 4 - Destroyed	Matthias/Nichols	7/31/44
6.	None	S	None	Monthly Operations Report, August 1944 (Code No. 1 used)	Cy 1 & 2 - Nichols Cy 3,4,5 & 6 - A.E.C. Files	Matthias/Nichols	8/30/44
7.	None	S	None	Monthly Operations Report, September 1944 (Code No. 1 used)	Cy 1 & 2 - Nichols Cy 3 - Groves Cy 4 & 5 - A.E.C.Files	Matthias/Nichols	9/30/44
8.	U-15-XX (TS-96)	TS	2 Secret drawings	Monthly Operations Report, October 1944 (Code No. 2 used)	Cy 1 & 2 - Nichols Cy 3 - Groves Cy 4 - A.E.C.Files Cy 5 - Destroyed	Matthias/Nichols	10/30/44
9.	None	S	None	Monthly Operations Report, November 1944 (Code No. 2 used)	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Matthias/Nichols	11/28/44

Item No.	Document No.	Class.	Attachments	Title of Document	Distribution of Document	From/To	Date
10.	None	S	1 drawing	Monthly Operations Report, December 1944 (Code No. 2 used)	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Matthias/Nichols	12/29/44
11.	None	S	None	Monthly Operations Report, January 1945 (Code No. 3 used)	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Matthias/Nichols	1/29/45
12.	None	S	None	Monthly Operations Report, February 1945 (Code No. 3 used)	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Matthias/Nichols	2/27/45
13.	None	S	None	Monthly Operations Report, March 1945 (Code No. 3 used)	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Matthias/Nichols	3/29/45
14.	U-36-XX	TS	None	Monthly Operations Report, April 1945 (Code No. 4 used)	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Rogers/Nichols	4/28/45
15.	U-39-XX (TS-120)	TS	U-40-XX	Monthly Operations Report, May 1945 (Code No. 4 used)	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Matthias/Nichols	5/28/45
16.	U-43-XX (TS-123)	TS	U-44-XX	Monthly Operations Report, June 1945 (Code No. 4 used)	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Matthias/Nichols	6/29/45
17.	U-45-XX	TS	U-46-XX	Monthly Operations Report, July 1945	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Matthias/Nichols	7/30/45

Item No.	Document No.	Class.	Attachments	Title of Document	Distribution of Document	From/To	Date
18.	XX-1	TS	XX-53	Monthly Operations Report, August 1945	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Matthias/Nichols	8/30/45
19.	XX-4	TS	XX-32	Monthly Operations Report, September 1945	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Matthias/Nichols	9/29/45
20.	XX-6	TS	XX-33	Monthly Operations Report, October 1945	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Matthias/Nichols	10/30/45
21.	XX-7	TS	XX-34	Monthly Operations Report November 1945	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Rogers/Nichols	11/30/45
22.	XX-9	TS	XX-40	Monthly Operations Report December 1945	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Matthias/Nichols	12/29/45
23.	XX-12	TS	XX-55 XX-39	Monthly Operations Report January 1946	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Clarke/Nichols	1/31/46
24.	XX-15	TS	XX-43	Monthly Operations Report February 1946	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Clarke/Nichols	2/28/46
25.	XX-19	TS	XX-46	Monthly Operations Report March 1946	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Clarke/Nichols	4/1/46

Item No.	Document No.	Class.	Attachments	Title of Document	Distribution of Document	From/To	Date
26.	XX-21	TS	XX-48	Monthly Operations Report, April 1946	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Clarke/Nichols	5/1/46
27.	XX-22	TS	XX-49	Monthly Operations Report, May 1946	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Rogers/Nichols	5/29/46
28.	XX-24	TS	XX-50	Monthly Operations Report, June 1946	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Clarke/Nichols	7/1/46
29.	XX-51	TS	XX-52	Monthly Operations Report, July 1946	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Clarke/Nichols	7/31/46
30.	XX-56	TS	XX-57	Monthly Operations Report, August 1946	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Clarke/Nichols	9/4/46
31.	XX-61	TS	XX-62	Monthly Operations Report, September 1946	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Clarke/Nichols	10/4/46
32.	XX-68	TS	XX-69	Monthly Operations Report, October 1946	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Clarke/Nichols	11/6/46
33.	XX-75	TS	XX-76	Monthly Operations Report, November 1946	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Clarke/Nichols	12/5/46
34.	XX-77	TS	XX-78	Monthly Operations Report, December, 1946	Cy 1 - Nichols Cy 2 - Groves Cy 3 - A.E.C.Files	Clarke/Nichols	1/6/47

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THIS DOCUMENT CONSISTS OF 2 PAGES
NO. 2 OF 4 COPIES, SERIES B

Richland, Washington

October 22, 1946

THE AREA ENGINEER
HANFORD ENGINEER WORKS

ESTIMATE OF LIFE OF MANUFACTURING PILES
Your letter of September 9, 1946

It is believed that the pile condition which will prevent further operation will be encountered when it is no longer possible to charge and discharge slugs from process tubes. This condition may prevail in the top central tubes loaded with 8-inch slugs after about 250,000 MWD of operation, but it is expected with reasonable assurance that the pile life can be extended to about 450,000 MWD by use of 4-inch slugs.

This value of 450,000 MWD should be considered the probable life of a pile. While it is conceivable that this life could be extended by various means such as reaming, by that time unforeseen phenomena may have appeared such that further efforts to maintain the pile could not be justified.

The principal pile condition which will require earlier repairs but which will not permanently impair operation will be the failure of process tubes in consequence of the end-wise expansion of the graphite. It is believed that most of the tubes of the pile will require replacement after 250,000-300,000 MWD of operation. This replacement would suffice to last well beyond the probable life of the pile, tube failure being expected again after 500,000 to 600,000 MWD. Other repairs would be

comparatively minor in nature, and would involve items such as special shielding around cracks opened by the graphite expansion and possible replacement of a few vertical thimbles near the sides of the pile.

It is estimated by the Maintenance Department that the pile could be entirely re-tubed during a shut-down of not more than three months. The equivalent of an additional month of irregular shut-down may be involved in replacement of a few tubes which rupture prematurely, and in handling the minor repairs mentioned above.

It should be noted that we do not as yet have a perfectly clear picture of the mechanism, extent, or consequences of the observed binding of gun-barrels. Our present concept, however, leads us to believe that gun-barrel binding will not prove to be a limiting factor in pile life.

W. K. MILTON, JR.
ADMINISTRATOR

ABG:rd

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DELIVERY OF PLUTONIUM

The first plutonium resulting from the Hanford process was delivered to the Army on 2 February 1945. This lot and the first few subsequent lots were received from the Contractor by Major O. H. Greager, representing the Area Engineer, and delivered to Los Alamos by a group of Military Intelligence couriers traveling by train.

By the latter part of March and early April 1945, the rate of plutonium production had reached a sufficient quantity level to justify the establishment of a standard operating procedure covering all phases of transfer by the Contractor to the Army, storage, and delivery to Los Alamos by truck convoy. This procedure was as follows:

> At frequent intervals (an average of three times a week), all plutonium ready for shipment was received by a representative of the Area Engineer (Major O. H. Greager, Major F. A. Valente, or Captain R. H. L. Stanford) from a representative of the du Pont Company (Mr. J. J. Urban or Mr. S. A. McKnight) at the site of the Contractor's vault in the Isolation (231) Building in the West Separation Area. Receipts were made in triplicate, which showed the total quantities of plutonium in the shipment; the history of the batch of irradiated uranium slugs from which the particular batch in any one can was isolated, the megawatt-days exposure of this batch of slugs; gross, tare and net weights of the shipping can; and monitoring results both for plutonium contamination (alpha counts) on the outside of the shipping con-

[redacted] SECRET [redacted]RD

tainer and for the intensity of beta and gamma radiation emanating from the shipping container. All data was certified by the representative of the du Pont Company and spot-checked by the Army enlisted man stationed in the area. This procedure and data were later modified (See Exhibits 1 & 2) to a receipt in duplicate showing merely the total quantity delivered on that day and a data sheet for each batch included in the shipment.

The cans were transported in a modified carry-all, 3/4 ton, 4 x 4 truck driven by a Special Engineer Detachment enlisted man and escorted as far as the West Separation Area gate by the officer representing the Area Engineer. At the gate, it was then turned over to a Military Police escort, consisting generally of an officer and three enlisted men, traveling in two sedans, one of which was equipped with a two-way radio tuned to the Hanford Engineer Works Patrol frequency. This Military Police detail conveyed the truck containing the shipment to the Army controlled storage area (Magazine Storage Area) where they were admitted on a personal recognition basis by the sergeant of the guard detail (Military Police) charged with the security of the Magazine Storage Area. The cans were then placed in a vault constructed of reinforced concrete with a double four-combination, bank vault type lock on the door.

Approximately once a week, all the cans available for shipment were packed in wooden boxes with sides of a special high-boron plastic, and were shipped by truck to Los Alamos. The trucks used were standard Army ambulances into which racks had been built in order to hold the shipping boxes securely. The convoy to Los Alamos was made up of two Military Intelligence officers and a detail of enlisted men (drawn from the Military Police Detachment stationed on the post) sufficiently large to drive the trucks and accompanying sedans. All vehicles in the convoy were equipped with two-way radios tuned to a special frequency for communication between vehicles. The men were heavily armed with pistols, riot guns, and sub-machine guns. The Military Intelligence detail drove straight to Salt Lake City, Utah, without stopping, except for gas and oil; lunches, etc., the trip normally taking about 36 hours. They were met at a prearranged rendezvous point in Salt Lake City by a similar detail from Los Alamos which took the trucks the rest of the way.

The shipping papers covering the transfer of plutonium from Hanford to Los Alamos were drawn up in the office of the Chief of Production immediately prior to the shipment and carried data showing the batch and can number, the history of the uranium slugs from which the particular batch was isolated, monitoring results on the shipping container, net quantity of plutonium in the shipment (See Exhibits 3 & 4).

In May 1945, Major Greager was transferred to other duties and his responsibilities in this regard were taken over principally by Captain R. E. L. Stanford, who made a few minor changes in the standard procedure such as the elimination of one of the copies of the receipt and transfer papers and the substitution of a standard Army sedan for the special truck to carry the shipping containers from the Contractor's vault to the Army vault.

During the latter part of June 1945 and throughout the month of July, as the urgency of product transfer to the Los Alamos site increased, shipments were made every five days. On 5, 7 and 9 August 1945, the only three shipments made by air occurred. Following this critical period, shipments were regulated to one every week until March 1946 when a schedule of one every ten days was adopted.

The above schedule was followed until 23 August 1946 when a new procedure was placed in effect. A U. S. Army hospital car, modified to provide a heavy vault for storage of product in transit and facilities for housing and preparation of meals for the Military Intelligence escort, was procured and put into service. The installation of these facilities was necessary from the standpoint of security, in order that the escort might be entirely self-supporting during the entire trip.

Under this new procedure, plutonium was transferred by truck from the Magazine Storage (213) Area to a previously arranged rendezvous with the railroad car in the open area of the Hanford

Engineer Works. From here the car was taken to the Riverland Declassification Yards of the Hanford Engineer Works where it was turned over to the Chicago, Milwaukee, St. Paul and Pacific Railroad. The car was then taken to Beverly Junction, Washington, on the main line of the railroad, where it was attached to a regular passenger train, and routed to Albuquerque, New Mexico and Oak Ridge, Tennessee, completing a round trip approximately every month. In routing this car, various routes between Hanford Engineer Works and Albuquerque and between Albuquerque and Oak Ridge were utilized, in order to provide greater security in shipment.

[redacted] [redacted] RD

FIRST PRODUCT SHIPMENT

The first batch of product, a highly concentrated solution of plutonium nitrate, was turned over to the Area Engineer on 2 February 1945.

DELETED DELETED

DELETED DELETED

Subsequent study and development of process operations have succeeded in reducing the total processing time for a similar amount of metal to 51 days.

[redacted] [redacted] RD

[redacted] DECLASSIFIED

FIRST PRODUCT SHIPMENT

The first batch of product, a highly concentrated solution of plutonium nitrate, was turned over to the Area Engineer on 2 February 1945. The "can" (See App. A 19) contained 80 grains of plutonium separated and isolated from approximately 3.1 metric tons of uranium metal which was at an average of approximately ten per cent of rated plutonium enrichment to be expected from the Piles when operating at design capacity. The total processing time for this batch from the date of discharge from the Piles was approximately 71 days. Subsequent study and development of process operations have succeeded in reducing the total processing time for a similar amount of metal to 51 days.

DECLASSIFIED

[redacted] DECLASSIFIED

HANFORD ENGINEER WORKS

~~S-A-M-P-L-E~~ ~~COPY~~ SECRET RD

11-15-46

G.E. NUCLEONICS PROJECT

GENERAL ELECTRIC COMPANY

DATA SHEET

For

Richland, Washington

Batch No.

DELETED

DELETED

DELETED

DELETED

Shipping Data on the Can

DELETED

DELETED

DOE b(3)

Survey Approval s/H. Foulthrop

Smear 10 d/m (maximum) Trunnions.

Mr/hr at surface 4 Lautitkin against side of can.

Above data certified for du Pont by s/H. A. Faskett Date 11-15-46

Copies to:

1 - Plant Manager's File

2 - Area Engineer

SECRET RD

Exhibit 1

HANFORD ENGINEER WORKS [redacted] 11-15-46

G.E. NU[redacted]S PROJECT

GENERAL ELECTRIC COMPANY

DECLASSIFIED

DATA SHEET

For

Richland, Washington

Batch No. 6J23

Process Data on the Product

Run	Total Concentration	Pile	Path	Date	Date of 2nd Peroxide Ppt.
No.	MW/Std. Ton				
203		F	6-27-46		11-9-46
206		D	8-13-46		11-11-46

*This run contained 7% of a composite of recycles.

Shipping Data on the Can

Can Serial No. 619 Purity 98.1%

Gross Weight 1850.0 Impurity 1.9%

Tare Weight 1474.8

Net Weight 375.2

Tare Weight Container Only 353.2

Survey Approval [redacted]

Smear 10 d/m (maximum) Fraction.

Mr/hr at surface 1 Inch[redacted] against side of can.

Above data certified for Am Prod by [redacted] Date 11-15-46

DECLASSIFIED

Copies to:

1 - Plant Manager's File

2 - Area Engineer [redacted]

Exhibit 1

HANFORD ENGINEER WORKS

~~S-A-E-R-E-T~~ ~~C-O-P-Y~~

G.E. NUCLEONICS PROJECT

~~SECRET~~

GENERAL ELECTRIC COMPANY

Receipt No. 234

DOE b(3)

Richland, Washington

RECEIPT FOR DELIVERY OF PRODUCT

On 11-18-46 Approximately

DELETED

DELETED

DELETED

DELETED

LAST ITEM

were delivered and accepted as indicated below:

Remarks: * This figure represents the reproducibility of chemical assay measurements.

Delivered by s/E. A. Fockett To s/Julius L. Yucker, Jr.
Capt. Air Corps

Receipt acknowledged s/Julius L. Yucker, Jr. Date 11-18-46
(Signature of Officer in charge)
Capt. Air Corps

Copies to:
1 - Plant Manager's File
2 - Area Engineer

~~SECRET~~

Exhibit 2

HANFORD ENGINEER WORKS [redacted] C-C-P-Y

DECLASSIFIED

G.E. NU[redacted]CT

GENERAL ELECTRIC

COMPANY

Receipt No. 23

Richland, Washington

RECEIPT FOR DELIVERY OF PRODUCT

On 11-18-46 Approximately 2,572,000

of product X in one or more packages designated as follows:

Batch	Shipment No.	Amount	Quantity Certified by
6/23	227	159,000 ± 1½ *	s/L. A. Foskett
6/24	"	155,000 ± 1½ *	s/L. A. Foskett
[redacted]			
6/25	"	158,000 ± 1½ *	s/L. A. Foskett
[redacted]			

LAST ITEM

were delivered and accepted as indicated below:

Remarks: * This figure represents the reproducibility of chemical assay measurement

Delivered by s/L. A. Foskett To s/Julius L. Yuckur, Jr.
Capt. Air Corps

Receipt acknowledged s/Julius L. Yuckur, Jr. Date 11-18-46
(Signature of Officer in charge)
Capt. Air Corps

Copies to:
1 - Plant Manager's File
2 - Area Engineer [redacted]

Exhibit 2

DECLASSIFIED DECLASSIFIED

X49-1

Form No. PC-1
(Rev. 6-3-46)

Material X-49.

Shipped to: C. O. Engr. Office, P. O. Box 1539, Santa
the material described below was shipped via courier

Batch No.	Can Serial No.	± — 1½%* Amount	Gross	Tare	N
DELETED			DELETED		

DOE 6(3)

X49-2

-E C-O-P-Y

~~SECRET~~ /RD/

WAR DEPARTMENT
United States Engineer Office
Hanford Engineer Works
P. O. Box 550
Pasco, Washington

SHIPPING MEMORANDUM FOR CLASSIFIED MATERIALS

x 1539, Santa Fe, New Mexico, Attn. Security & Intelligence Divi
via courier to C.O., U.S. Engr. Office, P. O. Box 1539, Santa F

Tare	Net	Tare Wt. cont. Only	Smear (Maximum)	
DELETED			DELETED	

DOE b(3)

~~SECRET~~ /RD/

~~SECRET/RD~~

X49-3

Shipping Memo No. COP 93.
Copy 1 of 5 copies.
Page 5 of 8 pages.

IALS

Division . I certify that on 25 November 194 6
Sta Fe, N.M. Attn. Chief, Security & Intelligence Division.

MR/hr Surf. (Lauritsen) Agnst Can	% Impurity	Contents PCT	Conc.	Discharge Date	2nd. Perox. PPT.
DELETED				DELETED	

DOE b(3)

Exhibit 3

~~SECRET/RD~~

X-49=1

SECRET/RD A-M-P-L-E- C-O-P-Y

Form No. PC-1
(Rev. 6-3-46)

Material X-49.

Batch No.	Can Serial No.	+- 1½% Amount	Gross	Tare	Net
DELETED			DELETED		

DOE b(3)

I certify that on _____, 194__, I per
examined the containers and found the shipment intact wit

SECRET/RD

X-49=2

-A-M-P-L-E- C-O-P-Y

SECRET RD

Gross	Tare	Net	Tare Wt. Cont. Only	Smear (Maximu
DELETED				DELETED

DOE
b(3)

_____, 194__, I personally received all items listed above
nd the shipment intact with no evidenc of having been tampered w

SECRET RD

X-49-3

~~SECRET~~ RD

Shipping Memo N
Copy 1 of
Page 6 of

Smear (Maximum)	MR/hr Surf. (Lauritsen.) Agnst Can	% Impurity	Contents PCT.	Conc
DELETED		DELETED		

Doe b(3)

(Sh

ıll items listed above and that I have
ıaving been tampered with.

Lt. Col. Corp
Chief of Prod

~~SECRET~~ RD

X-49=4

~~SECRET/RD~~

Shipping Memo No. COP 93.
Copy 1 of 5 copies.
Page 6 of 8 pages.

n-ity	Con-tents PCT.	Conc.	Discharge Date	2nd. Perox. PPT.
DELETED			DELETED	

DOE b(3)

(Shipping Officer)

Lt. Col. Corps of Engineers
Chief of Production
(Title)

(Consignee)

~~SECRET/RD~~

S-A-M-P-L-E C-O-P-Y

[redacted]

WAR DEPARTMENT
United States Engineer Office
Hanford Engineer Works
P. O. Box 550
Pasco, Washington

Shipping Memo No. COP 93
C[redacted] 5 [illegible]pies.
Page 5 [illegible]

DECLASSIFIED

SHIPPING MEMORANDUM FOR CLASSIFIED MATERIALS

ice, P. O. Box 1539, Santa Fe, New Mexico, Attn. Security & Intelligence Division. I certify that on 25 November 194 6
was shipped via courier to C.O., U.S. Engr. Office, P. O. Box 1539, Santa Fe, N.M. Attn. Chief Security & Intelligence Division.

	Gross	Tare	Net	Tare Wt. cont. Only	Smear (Maximum)	MR/hr Surf. (Lauri tsen) Agnst Can	% Im- purity	[illegible]	Conc.	Discharge Date	2nd. Perox. PPT.
	14580.0	14204.8	375.2	5515.2	10d/m trunnions	4	1.9	12	203	8-21-47	11-9-46
								58	206	8-13-46	11-11-46
	14930.0	14521.9	408.1	6032.0	6d/m sides and bottom	4	1.7	00	206	8-13-46	11-11-46

Exhibit 3

[redacted]

DECLASSIFIED

-I-T- C-O-F-I-D

[redacted]

Page 2.

DECLASSIFIED

Shipping Memo No. COP 93.
Copy [illegible] of [illegible] copies.
Page [illegible] of [illegible] pages.

ss	Tare	Net	Tare Wt. Cont. Only	Smear (Maximum)	MR/hr Surf. (Lauritsen.) Agnst Can	% Impurity	Contents PCT.	Conc.	Discharge Date	2nd. Perox. PPT.
7.5	14393.0	394.5	5804.0	8 d/m carrier outside overall	4	0.8	100	206	8-13-46	11-15-46

, 194__, I personally received all items listed above and that I have
he shipment in fact with no evidence of having been tampered with.

(Shipping Officer)
Lt. Col. Corps of Engineers
Chief of Production
(Title)

(Consignee)

DECLASSIFIED

[redacted]

S-A-F-L-E-D C-O-P-Y

~~SECRET~~ RD

OF-193W
(Rev. 2-19-46)

WAR DEPARTMENT
United States Engineer Office
Hanford Engineer Works
P. O. Box 550
Pasco, Washington

RECEIPT NO. CGR-93
Copy ___ of ___

RECEIPT FOR CLASSIFIED SHIPMENT

CERTIFICATE BY CARRIER OF SHIPMENT

I certify that on 11-27-46 I personally received from Captain Julius L. Fuchser, Jr. the items described below for delivery to C.O. Engr. Office P. O. Box 1539, Santa Fe, N. M., Attn: Security and Intelligence Division, Via Courier.

Item	Description
1	1 wooden Box No. 575, containing 1 can Ser. No. 619
2	1 wooden box No. 555, containing 1 can Ser. No. 152
12	1 wooden box No. 550, containing 1 can Ser. No. 271
18	1 classified envelope No. 3855 LAST ITEM

(Courier in Charge)
Lt. O. A. Simpson

Witnessed by:

(Name of accompanying courier)
Capt. J. F. Gopps

~~SECRET~~ RD

Exhibit 4